

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE J		PAGE OF PAGES 1 3	
2. AMENDMENT/MODIFICATION NO. 0003		3. EFFECTIVE DATE 07-Sep-2007		4. REQUISITION/PURCHASE REQ. NO. W81G6670749559		5. PROJECT NO.(If applicable)	
6. ISSUED BY U. S. ARMY ENGINEER DISTRICT, CHICAGO 111 NORTH CANAL STREET SUITE 600 CHICAGO IL 60606-7206		CODE W912P6		7. ADMINISTERED BY (If other than item 6) <div style="text-align: center;">See Item 6</div>			
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				<input checked="" type="checkbox"/> 9A. AMENDMENT OF SOLICITATION NO. W912P6-07-B-0006			
				<input checked="" type="checkbox"/> 9B. DATED (SEE ITEM 11) 07-Aug-2007			
				10A. MOD. OF CONTRACT/ORDER NO.			
				10B. DATED (SEE ITEM 13)			
CODE		FACILITY CODE					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input type="checkbox"/> is extended, <input checked="" type="checkbox"/> is not extended. Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning <u>1</u> copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required)							
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.							
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).							
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:							
D. OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) SUBJECT: LITTLE CALUMET RIVER, INDIANA, LOCAL FLOOD PROTECTION, STAGE 5 PHASE 2, MUNSTER, HAMMOND, AND HIGHLAND, INDIANA 1. The Bid Due Date is NOT extended by way of this Amendment and remains the same 17 September 2007 at 2:00p.m. Chicago Local Time. 2. By way of this Amendment No. 0003, bidders shall REMOVE in its entirety Specification Section 31 00 00 "Earth Work" and REPLACE with the Revised Section attached hereto. 3. USACE Responses to Contractors Inquires are on the next page of this Amendment. --- THIS AMENDMENT CONTINUES ON PAGE 2---							
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
				TEL: _____ EMAIL: _____			
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA		16C. DATE SIGNED	
_____ (Signature of person authorized to sign)				BY _____ (Signature of Contracting Officer)		07-Sep-2007	

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

The following items are applicable to this amendment:

CONTRACTORS INQUIRES AND USACE RESPONSES:
(Submitted During the Period of September 6, 2007 to September 7, 2007)

Question1. [Specification Section 31 00 00 Earthwork], Paragraph 1.4.4 Topsoil states "Topsoil shall be obtained from required stripping operations..." The data provided in the soil borings do not provide enough information to determine if the existing materials that will be obtained from the stripping operations meet all the requirements for Topsoil. It would be unreasonable burden for all bidders to acquire representative samples to test all the materials that will be obtained from the stripping operations. Are we then to assume then that the existing materials obtained from the stripping operations do indeed meet the requirements of the paragraph? Following that, if said materials do not meet the requirement, haul off-site would be regarded as extra work?

Response 1. The Contractor should not assume that the existing materials obtained from the stripping operations will meet the requirements of the topsoil paragraph. Paragraph 1.4.4 Topsoil states, "Topsoil shall be obtained from required stripping operations, AND FROM OFF-SITE SOURCES SELECTED BY THE CONTRACTOR AND APPROVED BY THE CONTRACTING OFFICER." (Emphasis added.) All materials encountered in the work that do not meet specification requirements for use in the work shall be classified as unsatisfactory materials and handled as such. Reference Specification Section 31 00 00, Paragraph 3.2.3 Disposition of Unsatisfactory Materials.

Question 2. [Specification Section 31 00 00 Earthwork], Paragraph 1.4.12 references "...non-commercial borrow source" as part of definition of Imported Earth fill. Fill that is obtained and imported from a commercial borrow source is considered Imported Earth Fill also, is it not?

Response 2. Yes; this Amendment revises Paragraph 1.4.12 of Specification Section 31 00 00, wherein, commercial is added as a borrow source. Bidders shall refer to the respective Paragraph and Section of the Revised Specification Section attached hereto.

Question 3. [Specification Section 31 00 00 Earthwork], Paragraph 3.2.7 discusses states that no satisfactory excavated materials shall be wasted without specific written authorization. Because there is a much larger volume of spoil bank excavation than there is satisfactory fill required for the project, will the contractor be allowed to waste satisfactory excavated materials on the landward side of the levee by extending the toe? Or will we be required to haul all excess spoil bank excavation off-site?

Response 3. It would be acceptable to utilize any satisfactory material within the work limits as long as it did not result in any drainage problems, to the adjacent property owner.

Question 4. [Specification Section 31 00 00 Earthwork], Paragraph 3.2.3 states that unsatisfactory materials are to be hauled off-site. How is this to be paid? Because this quantity has potential to be significant, a separate pay item may be appropriate.

Response 4. The cost for hauling off of material is covered under CLIN 0008AE Spoil Bank Excavation, as set forth in the Payments and Measurements Section of the Specifications.

Question 5. Sheet C-50: the section details for the storm sewer are labeled “A-A” and “B-B”. Should these be “B-B” and “C-C” respectively (corresponding to the profile)? Also (and more importantly), what detail do we use for the pipe to the left of (or outside of) the levee?

Response 5. The same drainage blanket detail is provided on multiple culvert sheets. For sheet C-50, the two section marks on the profile and cross section do not correspond to one another. The cross section was miss-labeled. This Amendment corrects the sections as follows: "A" should be "B" and "B" should be "C". For the second question, there are section marks at the beginning and ending of where the profile was taken in the plan view. The pipe in question is already shown in the profile. Note: This Amendment does not include a Revised Sheet C-50; however, the conformed copy of the resultant contract will incorporate the aforementioned correction.

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SECTION 31 00 00

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SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.1 *Special Note*

Italicized items within this specification pertain to the railroad closure.

1.2 SUMMARY

The work covered by this section consists of furnishing all plant, labor, equipment, and materials; and performing all operations necessary for stripping, stockpiling materials, excavation of existing levees, excavation of borrow areas, excavation of drainage ditches and swales, miscellaneous excavation, removal of unsuitable material from levee foundations, and all other excavation incidental to the construction of levees, drainage structures, and channel improvement excavation, *removal of unsuitable material, foundation preparation and backfilling of foundations for railroad closure structures and the removal and reinstallation of the rail track.* The work covered by this section also consists of performing all operations in connection with foundation preparation and the construction of levee embankments, including inspection trench excavations, new levee, placement of impervious fill for the access ramps, backfill at drainage structures, and other incidental earthwork as may be necessary to complete the levee, as shown on the drawings, as hereinafter specified, and as directed by the Contracting Officer or Contracting Officer's Representative (COR).

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 117	(2004) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 127	(2004) Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
ASTM C 136	(2005) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 142	(1997; R 2004) Clay Lumps and Friable Particles in Aggregates
ASTM C 535	(2003e1) Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C 88	(2005) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM D 1556	(2000) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(2002e1) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2166	(2006) Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
ASTM D 2487	(2006) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(2005) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(2005) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(2005) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 448	(2003a) Sizes of Aggregate for Road and Bridge Construction
ASTM D 698	(2000a) Laboratory Compaction of Soil Using Standard Effort (12,400 ft-lb/ft ³ (600 kn-m/m ³))

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 119	(1997) Handbook for Concrete and Cement Standard Method of Test for Flat or Elongated Particles in Coarse Aggregate
EM 385-1-1	(2003) Safety -- Safety and Health Requirements

1.4 DEFINITIONS

1.4.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SW-SM, SW-SC, SP-SM, SP-SC, SM, SC, ML, CL, and CL-ML. Satisfactory materials shall consist of material free from roots and other organic matter, contamination from hazardous, toxic, or radiological substances, trash, debris, ice, snow, frozen materials, and stones larger than 3 inches in any dimension. Satisfactory materials may also be called acceptable materials in these specifications. Satisfactory materials obtained from any given borrow source shall meet the environmental requirements in paragraph "Environmental Testing of Borrow Materials."

1.4.2 Unsatisfactory Materials

Unsatisfactory materials also include rubbish, vegetation, muck, highly plastic soils, construction debris, or other materials not meeting the definition of satisfactory materials. Material from any given borrow site that does not satisfy all the requirements set forth in paragraph "Environmental Testing of Borrow Materials" shall be deemed unsatisfactory and shall not be used for this contract.

1.4.3 Impervious Materials for Levee Construction

Satisfactory impervious materials shall consist of any materials classified as SC, CL-ML, or CL by ASTM D 2487 with not less than 35 percent by weight passing a No. 200 sieve.

1.4.4 Topsoil

Topsoil shall be natural, friable sandy loam material consisting of 30 percent to 50 percent sand. Topsoil shall have an organic content between 3 percent and 20 percent by weight, a pH range between 6.1 and 7.8, and shall be characteristic of representative productive soils in the vicinity. Topsoil shall be free from subsoil, noxious weeds, stones, roots, lime, concrete, ashes, slag, toxic substances, and all materials and substances that may be harmful and or hinder grading, planting, establishment, and maintenance operations. Topsoil shall be obtained from required stripping operations, and from offsite sources selected by the Contractor and approved by the Contracting Officer. All topsoil, from all sources, must meet the physical and chemical property requirements of this paragraph and paragraph 3.1.3 Topsoil.

1.4.5 Degree of Compaction

Degree of compaction for levee embankments, levee subgrades, and all other earthwork will be evaluated relative to the Standard Proctor Test described in ASTM D 698.

1.4.6 Excavation

Excavation shall include the satisfactory removal and deposition of all materials.

1.4.7 Embankment

As used in these specifications, the term "embankment" is defined as the earth fill portions of the levee or roadway subgrade prepared to finish grade after stripping and removal of unsatisfactory material.

1.4.8 Fill

As used in these specifications, the term "fill" includes all fill, except structural backfill, deposited in layers and compacted by rolling or tamping.

1.4.9 Structural Backfill

Structural backfill material shall consist of satisfactory materials free from rocks 3 inches or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. *Structural backfill under foundations shall be placed and compacted in*

layers in accordance with the specifications. Stone aggregate under the railroad closure structure foundation shall meet the gradation of ASTM D 448 #57 stone. A 6-inch compacted layer shall be placed under the foundation and compacted

1.4.10 Pervious Fill

Pervious fill for closure structures shall be well graded sand with 100 percent by weight passing the 3/8 inch sieve and not more than 10 percent by weight passing the No. 200 sieve.

1.4.11 Flowable Fill

A cementitious fill material consisting of Portland cement, water, admixtures, and fillers. Flowable fill shall be used as backfill in trenches for pipe structures, culverts, and utility cuts at the locations shown on the plans. Flowable fill shall conform to INDOT Standard Specification Section 213.

1.4.12 Imported Earth Fill

As used in these specifications includes all fill imported from off site, deposited or placed in layers and compacted, that is obtained from a commercial or non-commercial borrow source. Imported earth fill must meet the testing requirements detailed in paragraph ~~3.17 IMPORTED EARTH FILL TESTING REQUIREMENTS~~ 3.3 SELECTION OF BORROW MATERIAL. Terminologies used in project plans for various types of fill material that may fall under definition of imported earth fill include but are not limited to topsoil, structural backfill, pervious fill/materials, impervious fill/materials, satisfactory fill/materials, and flowable fill.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Plan of Operation; G, CS

Dewatering Work Plan; G, CS

Cofferdam Work Plan; G, CS

Commercial Borrow Source; G, CS

Survey of Existing Berm Crest Elevations; G, CS

Submit name and location of commercial source of borrow material and a letter from owner/operator of quarry or borrow site certifying that all environmental and operating permits have been acquired.

Soil Sampling Plan for Contractor-chosen borrow source; G, DH, PL

Prior to sampling borrow material from a Contractor-chosen borrow

source, the Contractor must have a Government approved soil sampling plan. The Contractor shall submit a soil sampling plan for environmental testing of the borrow material before proceeding with sampling of any given source. Samples collected prior to Government approval of a soil sampling plan will not be considered and any costs associated with sampling prior to approval of a soil sampling plan will be the Contractors expense. In addition to DH, other parties who may be reviewing the report include CS, PL, Local Sponsor, and any other entity deemed appropriate by the Government. The comments from all reviewers will be considered in the review and approval process of the soil sampling plan.

SD-06 Test Reports

Quality Control Test Reports

Contractor shall submit copies of all quality control testing within 48 hours after the completion of laboratory testing.

Environmental Soil Sampling Report for Contractor-chosen borrow source; G, DH

Prior to excavating material from any given borrow source and bringing it to the job site, the Contractor shall submit, for Government review and approval, the final report of environmental soil sampling and testing for any given source. No material from a borrow source shall be brought to the project site before the Contractor receives written Government approval of the environmental soil sampling report. In addition to DH, other parties who may be reviewing the report include CN and LS, Local Sponsor, and any other entity deemed appropriate by the Government. The comments from all reviewers will be considered in the review and approval process of the environmental soil sampling report.

SD-06 Test Reports

Topsoil Tests; G, CS

SD-07 Certificates

Analytical Laboratory Certification; G, CS

Contractor shall submit a valid Engineer Research Development Center, Waterways Experiment Station (ERDC/WES) letter of lab certification for the testing laboratory used. Significant lead time may be required to obtain an ERDC/WES certification.

1.6 SUBSURFACE DATA

Complete boring logs are appended to Section 00 31 32.13 GEOTECHNICAL DATA. The subsoil investigation report may be examined at the Corps of Engineers Chicago District office. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

1.7 BORROW, STOCKPILE, AND DISPOSAL AREAS

1.7.1 Borrow Area

All costs to load, haul, and place the material and any other work associated with the placement of the material are to be the Contractor's costs. The Contractor shall bear all costs for developing the borrow area as necessary to obtain the material including the construction, repair and maintenance of any roads or facilities damaged by the Contractor's operations. Materials required in this Section for construction may be taken from approved commercial borrow sites or from approved borrow site locations obtained by the Contractor.

1.7.2 Selection of Borrow Material

Borrow material shall be selected to meet the requirements and conditions for the particular fill or embankment for which it is to be used. The Contractor shall bear all expense of developing the source, including rights-of-way for hauling.

1.7.3 Testing of Borrow Materials

Testing of borrow materials will be required before construction begins. Testing requirements are presented in paragraph 3.3 SELECTION OF BORROW MATERIAL.

1.7.4 Stockpile Locations

Stockpile locations have not been specified. The Contractor may stockpile material anywhere within the work limits, on the landward side; but, not in or near a collector ditch, on the levee embankment, nor in a location which would interfere with the line-of-protection. No stockpile shall remain in place after construction. Stockpiled impervious material for levee construction shall be used in embankment construction and unsatisfactory material shall be disposed of in accordance with the environmental requirements of these specifications. Disposal of both satisfactory and unsatisfactory material shall be the Contractor's responsibility. Unsatisfactory material may be disposed of in an approved commercial disposal site.

1.8 PLAN OF OPERATION

1.8.1 General

The Contractor shall submit a Plan of Operation to the Contracting Officer for approval. The Plan of Operation shall cover the timetable for construction, the sequence in which the construction will take place, all subcontractor information including schedules and sequencing, maintenance of existing flood protection during construction, temporary outlets and drainage, fill placement procedures, equipment to be used, and the name of the commercial laboratory to be used for the testing services. *The work around and associated with construction of the railroad closure structures requires permission, a construction permit and coordination with Norfolk Southern Railroad. The Contractor shall identify this feature within the Plan of Operation. The Contractor shall coordinate with the Contracting Officer and Norfolk Southern Railroad regarding the time necessary to excavate and construct the closure structures to minimize railroad track outages. The Contractor is required to maintain one track in operation at all times during the construction and shall provide any necessary*

excavation support, staging requirements and bracing to maintain the one operational track. The Plan of Operation must be submitted to the Contracting Officer at least 15 days before starting earthwork operations.

1.8.2 Equipment

Before the work is started, the Contractor shall submit to the Contracting Officer for approval in the Plan of Operations a list of all plant, equipment and tools to be used in the performance of the work. The equipment shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and have the capability of producing the required compaction and meet the requirements specified in paragraph 3.7.1.1; and otherwise be suitable for construction of embankments as set forth herein.

1.8.3 Commercial Laboratory

Testing shall be performed at the expense of the Contractor by an approved commercial testing laboratory. The Contractor shall submit for approval in the Plan of Operations the name and qualifications of the laboratory to be used.

1.9 TESTING

1.9.1 General

1.9.1.1 Procedures

The Contracting Officer reserves the right to direct the location, and select the material for samples to be tested. Field moisture and density tests shall be performed when and where directed. Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When field in-place density is determined in accordance with ASTM D 2922, field in-place moisture shall be determined in accordance with ASTM D 3017. Laboratory moisture and density tests shall be determined in accordance with ASTM D 698. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted, if necessary, with ASTM D 1556. The calibration checks of both the density and moisture gages shall be made at the beginning of a job, on each different type of material encountered, or at intervals as directed by the Contracting Officer. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the Contracting Officer within 24 hours of conclusion of the tests as part of the Quality Control Test Reports.

1.9.1.2 Compliance

When Quality Control Test Reports indicate that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements, at no additional expense to the Government. Tests on recompacted areas shall be performed to determine conformance with specification requirements. All inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer; and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate times, will be the minimum acceptable for each type of operation and if, in the opinion of the Contracting Officer, compacted fill of an acceptable quality is not being obtained, increased testing rates will be required at

no cost to the Government. Tests of materials which do not meet the specified requirements will not be counted as part of the tests required.

1.9.2 Schedule of Tests (Minimum)

1.9.2.1 Moisture Density Relations

Levee embankment/fill: One for each type of levee fill material by the Standard Proctor Test (ASTM D 698). *Railroad Closure Structure: The fill material to be placed under each of the foundations shall be tested at least once per each type of foundation material by the Standard Proctor Test (ASTM D 698), prior to the construction of any concrete foundations.*

All other fills and subgrades: One for each type of fill material (ASTM D 698)

1.9.2.2 Field Density and Moisture Content

ASTM D 1556, or ASTM D 2922 and ASTM D 3017

Levee Embankment/Fill: One per 400 LF (In place measure) on each lift, or one per lift, whichever results in the greater number of tests; but, not less than 1 per day on days when fill is placed. The Contractor shall perform one (1) sand cone test (ASTM D 1556) after each ten (10) nuclear density tests performed, to check the accuracy of the nuclear gage. At least one (1) sand cone should be performed when the type of embankment fill material changes. *Railroad Closure Structure: The fill material to be placed under each of the foundations shall be tested at least twice at each foundation location in accordance with ASTM D 2922 prior to the construction of any concrete foundations.*

All subgrades: One per 1000 SY of subgrade prepared, but not less than one per location.

All hand compacted areas: One per 1000 SY of area prepared, but not less than one per location.

1.9.2.3 Unconfined Compressive Strength

For the portion of levee between stations 5N 17+00 to 31+71, for each type of fill material, two unconfined compressive strength tests will be run on laboratory compacted specimens in accordance with ASTM D 2166.

One test will be performed on a specimen compacted at about optimum moisture (+/-1%). The second test will be performed on a specimen compacted at about +3% of optimum moisture.

1.9.2.4 Atterberg Limits

One Atterberg Limits ASTM D 4318 test for each laboratory moisture density shall be performed only on cohesive materials. Ten additional Atterberg Limits tests shall be performed to correlate field density and moisture content tests to laboratory moisture density relation tests. The ten additional tests shall be done on representative samples taken from in place embankment material at the locations where field density tests are performed. Results of these tests shall be submitted to the Contracting Officer within 24 hours of their completion.

1.9.2.5 Topsoil Tests

Contractor shall submit at least three (3) representative tests, for review and approval, from each source of topsoil showing full compliance with paragraphs 1.4.4 Topsoil and 3.1.3 Topsoil. The first test shall be submitted and approved prior to the first placement of the topsoil from that source. The remaining two tests shall be taken, submitted and approved at approximately the third points of the total quantity expected from that same source. Testing shall be performed by an independent reputable laboratory whose normal business includes the testing of topsoil. If the topsoil tests indicate the addition of amendments to bring the topsoil into compliance, the Contractor shall include the incorporation of the amendments in accordance with the recommendations. The cost of the tests and any soil amendments shall be at no additional cost to the Government and are considered incidental to the bid item for topsoil.

1.10 DRAINAGE AND DEWATERING

1.10.1 Control of Water

The Contractor shall control, by acceptable means, all water regardless of its source. The Contractor shall be fully responsible for disposal of the water; and shall provide all necessary means to control and dispose of the water at no additional cost to the Government.

1.10.2 Drainage

Surface water shall be directed away from excavation and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavation slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and affected construction operations at the site shall be continually and effectively drained.

1.10.3 Control Measures

Control measures shall be taken as needed by the time the excavation reaches the ground water level in order to maintain the integrity of the in-situ material while the excavation is open. Dry excavations shall be maintained during fill placement and compaction. The methods to be used shall be detailed in the Dewatering Work Plan and submitted 15 days prior to starting point.

1.10.4 Ground Water

The Contractor should be aware that the ground water levels at the site are possibly high, often close to the ground surface and will vary seasonally and approximately with river levels. Any excavations may encounter significant seepage. The boring logs included with these plans and specifications should be thoroughly reviewed by the Contractor.

1.10.5 Cofferdams

The Contractor shall design temporary cofferdams and a temporary culvert bypass for the Hart Ditch Control Structure and submit a Cofferdam Work Plan. The cofferdams are to be removed after construction of the Hart Ditch

Control Structure. The bypass culvert can be removed or filled as directed in the plans and specifications. All sediment and entrained water removed from the river and bank area during cofferdam construction must be disposed of at an off-site location in accordance with all federal, state, and local laws. Sediment and entrained water may not be placed back into the river or on the banks. However, river water only, from the initial dewatering of the cofferdam to establish dry working conditions, may be discharged back to the river untreated. No muddy or turbid water, and no water mixed with sediment, may be discharged to the river.

1.11 EMBANKMENT/BACKFILL PROTECTION

Newly graded areas shall be protected from traffic and erosion, that may occur from any cause, prior to acceptance of the work; and shall be repaired and grades reestablished to the required elevations and slopes. All work shall be conducted in accordance with Section 01 57 20.02 10 ENVIRONMENTAL PROTECTION requirements of the contract.

1.12 MAINTAINING FLOOD PROTECTION AND DRAINAGE DURING CONSTRUCTION

Survey of Existing Berm Crest Elevations. Contractor shall survey existing berm crest elevations at 50 foot intervals throughout work limits and submit this data for review prior to construction. This data will be used to monitor that existing flood protection is maintained at all times during construction until new flood protection is completed in those areas.

The Contractor shall take appropriate measures to maintain flood protection within the project area for the duration of this contract. The existing flood protection shall be maintained until such time as the new flood barrier is constructed. This shall be addressed in the Plan of Operation by the Contractor.

The Contractor shall maintain drainage through construction of the line of flood protection across existing drainage paths such as swales, ditches, culverts, or pump outfalls, by temporary means as required to avoid increasing landward flooding of structures or private property. The Contractor shall be responsible for any increased flood damages that may be caused by construction operations as compared to preconstruction drainage conditions.

Where existing flap gated culverts are removed during construction, temporary replacement culverts shall prevent backflow from the river as needed. The Contractor shall coordinate construction of structures located on pump station outfalls and other storm sewer outlets with the local government or private entities that operate these facilities. In particular the outlets for the Baring, S. Kennedy, and Indianapolis pump stations shall be coordinated with the Hammond Sanitary District. The Contractor shall maintain their operability during construction. Bypass piping may be required during construction of new outlets.

Coffer dams and a bypass pipe will be required to construct the Hart Ditch Control structure as shown on plan sheet C-55.

There are two areas with specific restrictions that require special phased construction to prevent increased flooding impacts. These areas include:

1. The "no fill area" between the concrete portion of the Hart Ditch Control Structure and the floodwall along the south side of the Little Calumet River - No fill or any other blockage to flow shall be placed

in the no fill area as shown on plan sheet C-55 until all other Stage V-2 floodwalls, levees and drainage structures through the line of protection are completed. At that time, the tie back berm that connects the concrete portion of the Hart Ditch Control Structure and the floodwall along the south side of the river can be constructed.

2. A 100 foot long gap shall be left between stations 5S 51+00 and 5S 69+00, until the remainder of the levee has been constructed. Within the gap the levee shall not be built above elevation 597. The location of the 100 ft gap must be placed within the provided station range. The gap allows water to flow into the Wicker Park Golf Course during a flood event. This gap shall be filled after the no fill area is filled as described in the above paragraph.

These two items must be constructed in the order presented above, but not until all other items of the Phase V-2 project are constructed and functional. Constructing any of these items earlier in the construction sequence would cause increased flood levels and shall not be allowed.

1.13 CONSTRUCTION LIMITS

The Contractor shall perform all work within the construction limits as shown on the drawings. Notice shall be given to INDOT's Lake County District Director at least one week before commencing work on INDOT right-of-ways.

PART 2 PRODUCTS

2.1 2.1 Ballast

All ballast material shall be submitted to and approved by the Contracting Officer prior to delivery to the site. Ballast material type (granite or limestone) shall be as specified on the plans. If unspecified, granite is to be used, unless an alternate material is approved by the Contracting Officer.

Prepared ballast shall be crushed stone composed of hard durable particles, free from objectionable amounts of deleterious substances and shall meet the following specifications:

a. Gradation, as determined using ASTM C 136. One test shall be performed each 1000 tons or fraction thereof of material loaded for delivery.

Ballast shall comply with the modified AREA gradation #3, as shown in the table:

Percent Passing Standard Sieve Size by Weight

Type	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	No. 200
AREA #3 Mod	100	95-100	30-65	0-15	---	0-5	---	---	0.5 max

Note: All Gradation Testing shall be done according to ASTM C 136

2.2 Ballast Quality Requirements

a. Clay lumps and friable material - percentage as determined by ASTM C 142 shall not exceed 0.5%.

b. Material finer than #200 sieve - percentage as determined by ASTM C 117

test shall not exceed 0.5%.

c. Absorption - as determined by ASTM C 127 shall not exceed 1.0%.

d. Sodium sulfate soundness - average weighted loss after five (5) cycles shall not exceed 2.5%, as determined by ASTM C 88.

e. Resistance to degradation - as determined by ASTM C 535, grading type 2, (Los Angeles Abrasion Test 535-2) shall not result in a wear percentage greater than 27.5% for granite, or 25.0% for limestone.

f. Flat and/or elongated particles - as determined by U.S. Army Corps of Engineers' Test COE CRD-C 119, using a 3:1 ratio shall not exceed 5.0%.

g. Rock cementing value (limestone only) shall not exceed 200 psi. The test shall conform to the following procedure:

1. Take 350 grams of stone dust passing #100 mesh sieve. Dust is obtained by running approximately one (1) quart pea size stone chips (retained on #4 sieve, passing 3/8" sieve) in standard Deval Abrasion machine for 10,000 revolutions, or 5 to 6 hours at 30 to 33 rpm with three (3) standard ASTM C 535 balls.
2. Place dust on glass surface, make a crater, add approximately 70 cc water, cover and allow to absorb for one (1) minute. Wearing rubber gloves, mix roll, and knead for five (5) minutes to obtain a stiff dough. Adjust amount of water to obtain this. Place in an air tight can for two (2) hours.
3. Mold ten (10) standard 1" diameter x 1" high cylinders. Weigh about 30 to 31 grams stiff dough (or sufficient to obtain cylinders 1" plus or minus 1/32" high) in balance. Place mold and compress with 1475 lbs (1877.5 psi), holding load constant for one (1) minute.
4. Air Dry cylinders for 20 hours at room temperature, then for four (4) hours in hot air bath at 212°F. Place immediately in a desiccator for 20 minutes and then test in compression testing machine with pivoted or ball socket head for uniform load distribution. Load is applied at 600 lbs. per minute.
5. Report average crushing strength in psi as cementing value of stone. Calculation: $PSI = Load / 0.7854$.

h. Contractor shall furnish a certification of compliance stating that the material meets or exceeds the requirements of the specification. For sources not currently approved by the Contracting Officer, the Contractor shall provide independent certification as required by the Contracting Officer.

i. Graded aggregates subject to on site stockpiling prior to placement shall be rebled as directed by the Contracting Officer to ensure compliance with the original gradation specified.

PART 3 EXECUTION

3.1 STRIPPING

After inspection and approval of cleared and grubbed areas, stripping may proceed.

3.1.1 Levee Foundation

The area within the limits of the levee foundation shall be stripped to remove heavy growth of grasses, weeds, other vegetation, and surface soils to a depth not to exceed 12 inches as shown on the drawings.

3.1.2 Borrow Areas

The Contractor shall remove heavy growth of grasses, weeds, other vegetation, and topsoil.

3.1.3 Topsoil

Stripped materials suitable for use as topsoil, shall be spread on areas already graded and prepared for topsoil; or when so specified topsoil shall be transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified by the Contracting Officer. Topsoil shall be kept separate from other unusable excavated materials, brush, litter, objectionable weeds, roots, stones larger than 3 inches in diameter, and other materials that would interfere with planting and maintenance operations. Unusable material shall be removed and properly disposed of.

3.2 EXCAVATION

3.2.1 General

Excavation shall consist of removal of every type of material encountered within the limits of the project in preparing the foundations to the lines, grades, and elevations indicated on the drawings as specified herein, or as approved by the Contracting Officer. Excavation shall consist of removal of material for the inspection trenches, structures, and for ditches and swales, to the sections indicated on the drawings, or as approved by the Contracting Officer. Excavation also includes removal of objectionable materials; and obtaining required fill materials from borrow areas. Care shall be exercised by the Contractor not to excavate below the grades shown on the drawings, or as approved by the Contracting Officer. Grading shall be in conformity with the typical sections shown, and the tolerances specified in paragraph 3.12 GRADE TOLERANCES. Any excessive excavation, as determined by the Contracting Officer, due to the fault or negligence of the Contractor, shall be backfilled to grade with satisfactory, thoroughly compacted material to grades shown on the drawings. Corrective measures shall be done by and at the expense of the Contractor. During construction, excavation and fill procedures shall be performed in a manner and sequence that will provide proper drainage at all times and in accordance with EM 385-1-1 standards. Excavation areas shall be kept free from water during placement of pipe, concrete, earth fill, and backfill.

3.2.2 Disposition of Satisfactory Materials

Excavated materials which are suitable to construct the embankment or other fills shall be placed directly therein or stockpiled for future use within the limits of the work, as shown on the drawings, unless otherwise directed by the Contracting Officer.

3.2.3 Disposition of Unsatisfactory Materials

Materials encountered within the limits of the work which are

unsatisfactory for use in the completed project shall be hauled off site and disposed of at an approved commercial disposal site or as directed by the Contracting Officer. Unsatisfactory materials shall be excavated below grade and replaced with satisfactory materials as directed by the Contracting Officer.

3.2.4 Excavation for Structures and Utilities

Excavation for structures and utilities shall be performed within the work limits shown on the drawings, or as modified by the Contracting Officer. *Excavation associated with the Railroad Closure Structure shall be done only after coordination and permission is obtained from Norfolk Southern Railroad and the Contracting Officer. The excavation shall be performed to the limits shown and to the planned foundation level shown on the drawings.*

Any unsatisfactory material encountered at the planned foundation level shall be removed to the level as directed by the Contracting Officer. The Contractor is required to maintain one track in operation at all times during the construction process and shall provide any necessary excavation support, staging requirements and bracing to maintain the one operational track.

3.2.5 Drainage Ditches and Swales

Drainage ditches and swales and culvert outlet ditches and swales shall be excavated accurately to the cross-sections, lines, grades, and elevations shown on the drawings. Care shall be taken not to excavate ditches and swales below grades specified on the drawings. Satisfactory material excavated from drainage ditches and swales shall be stockpiled as covered in subparagraph 3.2.2, unless otherwise directed by the Contracting Officer. Unsatisfactory materials excavated from drainage ditches and swales and any excess material shall be removed from the site as covered in in subparagraph 3.2.3, or as directed by the Contracting Officer. The Contractor shall maintain all drainage ditch and swale excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work. Any fence removed for the ditch and swale excavation shall be replaced with similar construction.

3.2.6 Inspection Trench

An inspection trench will be installed for the total length of the levee as shown on the plans. This work shall be considered incidental. The inspection trench will be used to locate any undesirable underground features such as near surface pipes, buried debris, unsatisfactory foundation materials, etc. Any pipes, tiles, conduits, buried debris, or other unsatisfactory foundation materials encountered shall be removed from within the footprint of the levee or plugged as directed by the Contracting Officer. Excavation and backfilling of the inspection trench shall be performed in a continuous operation. The Contractor shall notify the Contracting Officer 48 hours prior to start of this work, so that the Contracting Officer's Representative may be present during excavation and backfilling work. During construction of the inspection trench, the Contractor shall immediately notify the Contracting Officer's Representative in the event that soil conditions encountered are significantly different from those shown in the boring logs. Of particular concern are open work gravels, whether or not they are water bearing, or other granular materials, located immediately beneath the proposed levee fill, especially in the area of Optimist Lake. The Contractor shall not place impervious levee fill in these areas without the expressed approval of the Contracting Officer's Representative.

3.2.6.1 Inspection Trench Type

The trenches shall be excavated to the dimensions indicated below unless otherwise indicated on the drawings. The slit inspection trench shall be a minimum of 1.5 feet wide and 6 feet deep. If a slit trench cannot be maintained stable due to soil conditions, the trench shall be expanded to permit inspection by the Contracting Officer's Representative.

3.2.6.2 Inspection Trench Backfill

After inspection by the Contracting Officer's Representative and upon authorization, the inspection trench may be backfilled. Backfilling shall be completed at least 200 feet in advance of the embankment construction. The excavated material may be used to backfill the trench if it is considered to be satisfactory under subparagraph ~~1-3-11.4.1~~ and does not include granular material. All inspection trench backfill shall be compacted to a density comparable to that of the surrounding soil. Unsatisfactory material as defined in subparagraph ~~1-3-21.4.2~~ shall be removed and replaced with impervious levee material as defined in subparagraph ~~1-3-31.4.3~~ when so directed by the Contracting Officer.

3.2.7 Utilization of Excavated Materials

All unsatisfactory materials removed during excavation shall be disposed of by the Contractor in an approved commercial disposal site. No satisfactory excavated materials shall be wasted without specific written authorization.

Satisfactory materials may be stockpiled in the staging areas until the material is incorporated into the completed work. Upon completion of the work, all excess excavated materials shall be removed from the project and properly disposed. No excavated materials shall be disposed in such a manner as to obstruct the flow of any stream, or be detrimental to the completed work in any way.

3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be satisfactory material, as defined in paragraph ~~1-3-11.4.1~~, selected to meet the requirements and conditions for the particular fill for which it is to be used. Borrow material shall be obtained from a commercial borrow site or from Contractor-chosen borrow site. The Contractor shall bear all the expense of developing the borrow site. Contractor shall not bring material to the job site until all required submittals and reports pertaining to borrow material have been approved in writing by the Government. If the Contractor brings material to the job site without first obtaining written approval from the Government, the materials shall be removed within forty-eight (48) hours of receipt of a direction from the Government to remove the material from the job site. The Contractor shall not be entitled to any additional increase in the contract price or any additional time for completion of the contract associated with the removal of the materials notwithstanding any other provision in the contract. If the Contractor has not completed removal of the material from the job site within forty-eight (48) hours of receipt of a direction from the Government to remove the material for the job site, this failure shall constitute a material breach of the contract and entitle the Government to all appropriate remedial actions including, but not limited to, termination for default.

Contractor shall comply with the borrow/disposal sites and quarries requirements in SECTION 01 10 00.00 03 GENERAL PROVISIONS.

3.3.1 Borrow materials from commercial borrow source

The contractor shall submit for approval, prior to importing borrow material from a commercial borrow source, the name of the borrow site or quarry and the supporting documentation required in SECTION 01 10 00.00 03 GENERAL PROVISIONS. The commercial borrow site or quarry shall be in the business of providing borrow and whose materials meet all applicable federal, state, and local environmental statutory and regulatory requirements.

3.3.2 Environmental Testing of Borrow Materials

Contractor shall submit for approval a request to utilize any given borrow source. Submission for approval includes a soil sampling plan and an environmental soil sampling report. Contractor shall not bring material to the job site until the soil sampling plan and environmental soil sampling report, for any given source, are submitted and have been approved in writing by the Government. The Contractor shall remove material brought to the job site that does not have written Government approval in accordance with the provisions set forth in paragraph "Selection of Borrow Material". Any costs associated with deviating from the requirements in this section will be the Contractors expense.

Material obtained from any borrow source will be considered acceptable under this part if the values obtained by the analysis of all parameters specified in paragraph "Soil Sampling Plan for Borrow Source" are below values included in Tables 1 attached. If the values obtained by the analysis of one or more of the parameters set forth in Table 1 are exceeded, the material from that source will be deemed unsatisfactory and may not be used for this contract. Analytical results shall not be averaged for purposes of determining compliance with the requirements set forth in Table 1.

Materials classified as commercially manufactured stone or sand, or topsoil, do not require the environmental testing stated in this paragraph. Materials obtained from the project site do not require the environmental testing stated in this paragraph.

3.3.2.1 Soil Sampling Plan for Borrow Source

The Contractor shall address the following, at a minimum, in the Soil Sampling Plan for any given source of material: location of the material source, proposed sample locations (including a map), volume of borrow material, sample collection and handling procedures, laboratory selected, laboratory certifications, parameters to be analyzed, analytical methods, laboratory reporting limits, QA/QC requirements, chain of custody procedures, the quality assurance project plan (QAPP), data quality objectives, data validation, and reporting requirements. The data quality objectives for the soil sampling are to detect contamination and produce results that are at or below the values for all parameters included in Table 1 attached. If a phase I or phase II environmental site assessment of the borrow site exists, this information shall be submitted as part of the sampling plan. The Contractor shall use and submit the name and qualifications of a qualified environmental professional who will conduct all sampling, analysis, and reporting. The laboratory selected to perform the laboratory analysis must comply with the requirements of the DOD QSM and shall be certified through the National Environmental Laboratory Accreditation Conference/National Environmental Laboratory Accreditation

Program (NELAC/NELAP) certification program.

The Contractor shall sample and test the borrow material for all of the parameters listed in Tables 1 using SW-846 methodology. Total metals analysis shall include the following metals: Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Mercury, Nickel, Silver, Lead, Zinc, and Selenium. Contractor shall collect at least one composite sample for every ½ acre of property where borrow will be obtained, from any given borrow location. A minimum of three composite samples shall be collected for any given borrow location. Contractor shall composite each individual sample to represent the vertical extent of the borrow area. Contractor shall distribute samples to adequately cover the horizontal extent of the borrow area. The proposed sample locations shall be included in the soil sampling plan.

3.3.2.2 Environmental Soil Sampling Report for Contractor-chosen borrow source

After completing soil sampling and testing from any given borrow source, the Contractor shall prepare and submit an environmental soil sampling report environmental soil sampling report for Governmental approval. The report shall consist of, at a minimum: a narrative of information obtained during sampling, copy of field notes, identification of sample locations from borrow material, copies of chain of custody forms, copies of laboratory data, a table comparing the analytical results to the contract requirements specified in paragraph "Environmental Testing of Borrow Materials", and a discussion of results and conclusions. The report shall be called "final" after approval is made by the Government. The Contractor is responsible for maintaining accurate records to support information for development of the borrow source. Only after receiving written Government approval of the environmental soil sampling report for any given borrow source will the Contractor be allowed to import soil material from that source to the contract job.

3.4 EMBANKMENT/FILL FOUNDATION PREPARATION

3.4.1 Foundation Preparation

All foundation work shall be completed at least 200 feet in advance of the levee embankment construction.

3.4.2 Placement

Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials. Backfilling shall not begin until construction below finish grade has been approved. Backfill shall be brought to the indicated finish grade. Backfill shall not be placed in wet or frozen areas. Each layer of fill and backfill shall be compacted to not less than the percentage of maximum density and moisture content specified. After excavation or stripping of the embankment/fill foundation, and excavation and backfilling of the inspection trench to the extent indicated on the drawings or otherwise required, cavities or depressions shall be broken down, where so directed, to flatten out the slopes. Immediately prior to the placement of embankment/fill material, the entire earth surface on or against which embankment/fill is to be placed, except areas which were occupied by roadways within the levee foundation, shall be thoroughly broken to a depth of 12 inches. Existing pavement and subbase within the levee foundation shall be removed from the embankment foundation. All areas shall be

compacted to a minimum 95 percent maximum dry density ASTM D 698.

3.4.3 Fill Locations

If for any cause the foundation, or other surface that is to receive levee embankment/fill, is such that, in the opinion of the Contracting Officer, a plane of seepage or weakness might be induced, it shall again be thoroughly scarified before placing the material thereon. All scarifying and breaking of ground surface shall be done parallel to the centerline of the levee.

3.4.4 Foundation within the Levee Footprint

The foundation within the levee footprint shall be cleared of unsatisfactory material as defined in subparagraph ~~1-3-21.4.2~~ Unsatisfactory Materials. Ponded water greater than 12 inches deep shall be drained before placement of embankment/fill. The contractor will be permitted to use the displacement method described below to construct an earthen cofferdam to permit dewatering of the levee foundation, where feasible. This method will not be permitted in the Optimist Lake area. Where surficial granular fill is encountered within the levee footprint, the fill shall be removed from within the levee footprint and replaced with compacted impervious levee fill. Where highly plastic or soft soils are present near or at the surface within the levee footprint, the material shall be removed and replaced with compacted impervious levee fill.

3.4.5 Fill Material

Where fill must be placed in standing water not greater than 12 inches deep, or where foundation conditions will not support equipment for placement of an 8 inch lift, the Contracting Officer may waive the maximum 8 inch loose lift thickness restriction for the first lift of the embankment/fill. These conditions may exist in areas inundated with ponded water, marshes, secondary river channels, or wetlands. When approved by the Contracting Officer, and where material must be placed in water, the levee shall be constructed by pushing the embankment/fill material ahead of the equipment so as to displace the water. Water must not be entrapped in or behind the embankment/fill material. Fill should be advanced with a V-shaped leading edge so that the center of the fill is most advanced, thereby displacing soft soil and/or water to both sides. In areas where placement is along an existing embankment, displacement of soft soil and/or water shall be away from the embankment. Fill shall be placed until it reaches an elevation 1.0 foot above water surface, or until a stable fill surface is obtained. The Contractor will have achieved a stable surface when the fill can be compacted to the extent that the top 8 inches meet the compaction requirements of subparagraph 3.7.1.3 "Compaction". To facilitate compaction, fill placed in standing water shall not exhibit water contents greater than two (2) percentage points above the optimum moisture content. Placement of fill in standing water shall be specifically addressed in the Plan of Operation.

3.4.6 Staged Construction

Borings indicate that portions of the foundation soils beneath the levee alignment between stations 5N 17+00 to 31+71 are soft. These soils may cause stability problems during or immediately after construction. To minimize the risk of levee failure in this area the Contractor shall build this portion of the levee using staged construction. The levee shall be constructed to half of the design height as shown on the drawings. This partial levee section will then be allowed to consolidate for a period of

not less than 120 calendar days before the remaining levee fill is placed. The partial levee section will be constructed to its full width as shown on the drawings. Fill placed within the first half of the design height may be compacted at water contents up to +3 percent over optimum provided that the required density can be achieved and the material possesses a minimum shear strength of 450 psf. The Contractor has the option to perform interim surveys at the beginning and end of the consolidation period for the purpose of establishing levee fill quantities. These optional surveys will be at no additional cost to the Government and are considered as an incidental cost to be included in the bid items for levee fill.

3.4.7 Preload Embankment

Preload embankments have been specified to surcharge the soft foundation soils at the locations shown before the structure is constructed. Wick drains and a granular blanket will be installed, as specified in Section 33 46 26.19, before the fill for the preload embankment is placed. In addition, a settlement gage shall be installed beneath the preload embankment to monitor the foundation settlement. It is estimated that six (6) months will be required to surcharge the soft foundation soils with wick drains installed as shown. The surcharge period will be considered completed after the time-settlement curve based on the settlement gage readings indicates the primary consolidation of the foundation soils is essentially complete. However, the full surcharge shall be applied for a minimum of three (3) months, regardless of the observed settlement. The settlement data shall be submitted to the COR for review. Removal of the preload embankment shall not be performed without authorization of the COR.

Approx. Location	Description	Anticipated Settlement
STA 5S 73+00	48" Gatewell (Tri-State)	4.4"
STA 6N 12+60	24" Culvert (6-3C)	5.3"
STA 6N 22+00	24" Culvert (6-5C)	7.5"
STA 6N 34+40	12" Culvert (6-7C)	7.6"

3.5 FROZEN GROUND

3.5.1 Fill Placement

No fill shall be placed upon natural ground or previously placed fill which is frozen or covered with snow or ice.

3.5.2 Fill Material Conditions

Under no circumstances shall frozen earth, snow, or ice be placed in the embankments/fills.

3.6 EMBANKMENT MATERIALS

The levee and preload embankments shall be constructed of earth material obtained from borrow areas as prescribed in paragraph 3.3 SELECTION OF BORROW MATERIAL, having the characteristics defined in subparagraph ~~1.3.3~~ 1.4.3 Impervious Materials for Levee Construction.

The granular blanket installed beneath the preload embankment shall be constructed of clean, natural granular material, and filter fabric. The material for the granular blanket shall be coarse aggregate, as described in Section 32 11 23.00 GRADED CRUSHED AGGREGATE BASE COURSE.

The filter fabric to be used for the preload embankment shall be as specified in Section 31 05 19.13 GEOTEXTILES USED AS FILTERS AND UNDERLAYS.

3.7 EMBANKMENT CONSTRUCTION

3.7.1 Compacted Impervious Levee Embankment

The compacted levee embankment shall be built to the grades and elevations shown on the drawings.

3.7.1.1 Equipment

A.) Compaction of cohesive soils shall be accomplished by sheepsfoot rollers. The Contractor has the option of using either self-propelled or tractor-drawn sheepsfoot rollers. The tractor drawn rollers shall consist of a heavy duty double drum unit with a drum diameter not less than 60 inches and an individual drum length of not less than 60 inches.

The drums shall be water, or sand and water ballasted. Each drum shall have staggered feet uniformly spaced over the cylindrical surface such as to provide approximately three tamping feet for each two square feet of drum surface. The tamping feet shall be seven (7) to nine (9) inches in clear projection from the cylindrical surface of the roller and shall have a face area of not less than five (5) nor more than seven (7) square inches. The roller shall be equipped with cleaning fingers, so designed and attached as to prevent the accumulation of material between the tamping feet, and these cleaning fingers shall be maintained at their full length throughout the periods of use of the roller. The weight of the roller shall not be less than 3500 pounds per foot of linear drum length weighted, and shall not be more than 2000 pounds per foot of drum length empty. The two drums comprising one roller unit shall be yoked such that they will oscillate when traversing uneven surfaces. The design and operation of the roller shall be subject to the approval of the Contracting Officer who shall have the right at any time during the prosecution of the work to direct such repairs to the tamping feet, minor alternations in the roller and variations in the weight as may be found necessary to secure optimum compaction of the earth fill materials. The Contractor may be required to add ballast to the roller to the maximum capacity specified by the manufacturer of the roller. The roller shall be operated at a speed not to exceed 3.5 miles per hour. If the roller is drawn by a rubber-tired tractor, the use of the rubber-tired tractor shall be discontinued if the tires leave ruts that prevent uniform compaction by the tamping roller.

B.) At the option of the Contractor, self-propelled sheepsfoot rollers may be used in lieu of tractor-drawn sheepsfoot rollers. Self-propelled rollers exceeding the empty weight requirement may be used provided that by the substitution of tamping feet having a face area not exceeding 14 square inches, the nominal foot pressure on the tamping feet of the self-propelled roller can be adjusted to approximate the nominal foot pressure of the towed roller for the particular working condition required for the towed rollers. For self-propelled rollers, in which steering is accomplished through use of rubber-tired wheels, the tire pressure shall not exceed 40 pounds per square inch. Self-propelled rollers shall be operated at a speed not to exceed 3.5 miles per hour. Hand compactors shall be used as directed by the Contracting Officer.

C.) The Contracting Officer may approve a specific sheepsfoot roller

provided it does not deviate significantly from the preceding description, and can achieve the required compaction. Trucks, dozers, and other earth moving equipment shall not be used as substitutes for a sheepsfoot roller.

3.7.1.2 Placement

A.) The Contractor shall submit for approval to the Contracting Officer a written procedure with sketches of their placement and procedure prior to the start of embankment placement. This procedure shall be included in the Plan of Operations. The gradation and distribution of materials throughout the compacted embankment shall be such that the embankment will be free from lenses, pockets, streaks, and layers of material differing substantially in texture or gradation from surrounding material.

B.) After dumping, the materials shall be spread by bulldozers or other approved means over the embankment areas. Layers shall be started full out to the slope stakes; and shall be carried substantially horizontal with sufficient crown or slope to provide satisfactory drainage during construction. Unless otherwise directed, the thickness of impervious layers before compaction shall be not more than 8 inches. When in the opinion of the Contracting Officer, the surface of any compacted layer is too smooth to bond properly with the succeeding layer, it shall be scarified to the satisfaction of the Contracting Officer before the succeeding layer is placed thereon.

C.) During the dumping and spreading processes, the Contractor shall maintain at all times an adequate workforce to remove all stones greater than 3 inches in maximum dimension, roots, and debris from all embankment materials. Stones, roots, and debris removed from the embankment shall be removed from the site. Removal and disposal of such stone, roots and debris as specified herein will not be paid for separately; but all cost in connection therewith will be considered a subsidiary obligation of the Contractor and will be included in the applicable contract price. The entire surface of any section of the embankment under construction shall be maintained in such condition that construction equipment can travel on any part of any one section. Ruts in the surface layer shall be filled satisfactorily before compacting.

D.) After a layer of impervious embankment material has been dumped and spread, it shall be disked to break up and blend the embankment materials. Disking shall be performed with a heavy disk plow or other approved disk, to the full depth of the layer. If one pass of the disk does not accomplish the breaking up and blending of materials, additional passes of the disk may be required; but in no case will more than 3 passes of the disk on any one layer be required for this purpose.

3.7.1.3 Compaction

A.) Each lift of impervious embankment shall be compacted to a minimum of 95 percent maximum dry density (Standard Proctor Test) within plus or minus 2 percent of optimum moisture as determined by the moisture density relation ASTM D 698.

B.) If in the opinion of the Contracting Officer or Contracting Officer's Representative, the material is too dry for proper

compaction, the Contractor will be required to pre-wet the material, or to uniformly distribute sufficient moisture in each layer before rolling to permit the desired compaction. Material that is too wet shall be spread on the embankment and permitted to dry, assisted by disking, if necessary.

3.7.1.4 Preload Embankment

The preload embankment shall be constructed in accordance with these specifications and as shown on the drawings. After the surcharge period is completed, but before the embankment fill is placed, the preload material, granular blanket and filter fabric shall be removed in its entirety.

3.7.1.5 Reading of Settlement Gages

Gage readings taken in conjunction with preloading activities shall be performed as follows. The Contractor shall read the settlement gage before placing fill, before and after the addition of each new section of riser pipe, and immediately upon completion of fill placement. After completion of fill placement, the Contractor shall take four (4) readings at weekly intervals. Thereafter, readings shall be taken monthly. The reading period shall continue until the settlement gage readings indicate that primary consolidation of the foundation material is substantially complete.

The COR shall review the settlement data. When the settlement stops, the COR will direct the Contractor to stop taking the readings, and proceed with construction.

3.7.2 Dressing

The entire levee embankment, including topsoil where required, shall be brought to not less than the prescribed gross cross section at all points. The surface shall be finished to a smoothness suitable for the application of turfing materials. Vertical tracking on side slopes should be used to minimize erosion rate.

3.8 SPREADING TOPSOIL

Topsoil shall be distributed and spread uniformly on the levee to the average thickness of 6 inches unless shown otherwise on the plans. Topsoil shall be spread such that planting can proceed with little additional soil preparation or tillage. Surface irregularities resulting from topsoiling or other operations shall be leveled to prevent depressions. Compacted soil shall be slightly scarified or disced to assure bond.

3.9 ANNULAR BACKFILL

Annular backfill for culverts through the levee shall be placed as shown on the drawings.

3.10 STRUCTURAL BACKFILL

3.10.1 Structural Backfill Material

Structural backfill shall consist of refill around structures. In areas below existing grade where impervious fill is not indicated, the backfill may be any satisfactory material. Impervious fill shall be placed as shown on the drawings. Structural backfill shall not be placed around or adjacent to a structure until the structure is completed, or until a specified time interval has elapsed after completion.

3.10.2 Placement

Backfill shall be placed in 6-inch thick loose lifts and thoroughly compacted. Unless otherwise directed, the placing and compacting of all backfill material and the control of its moisture content shall conform to the applicable provisions of paragraphs ~~1.3, 1.6~~1.4 DEFINITIONS, 1.7 BORROW, STOCKPILE AND DISPOSAL AREAS, 3.7.1.2, and 3.7.1.3. Heavy compaction equipment shall not be permitted to operate within three (3) feet of structures, conduit sides, or conduit tops. Within this restricted area, and other areas where rollers can not be used, the material shall be compacted by means of hand operated power tampers. Unless otherwise specified, the materials shall be placed and compacted to obtain 95 percent maximum dry density as determined by ASTM D 698.

3.11 CROSS SECTIONS

Unless otherwise specified, the dimensions and slopes shall conform to the applicable "Typical Sections" shown on the drawings.

3.12 GRADE TOLERANCES

All levee embankments shall be constructed to the lines, grades and cross-sections shown on the drawings. At all points a tolerance of plus five-tenth (5/10) of one foot above, and minus zero feet below the prescribed grade will be permitted in the final dressing, provided that any excess material is so distributed that the crown of the levee drains riverward; and that there are no abrupt humps or depressions in surfaces or bulges in the width of the crown. However, this tolerance above grade may be modified at locations where, in the opinion of the Contracting Officer, such modifications will not impair the design or appearance of the structure. For topsoil, a tolerance of 1 inch above the thickness as shown on the drawings will be permitted. No tolerance will be allowed for the drainage ditches and swales.

3.13 SLIDES

In the event a slide occurs on any part of the levee during construction or after its completion, but prior to its acceptance, the Contractor shall, upon written order of the Contracting Officer, cut out and remove the slide from the levee and then rebuild that portion of the levee in accordance with the applicable provisions of paragraphs ~~1.3, 1.6~~1.4 DEFINITIONS, 1.7 BORROW, STOCKPILE AND DISPOSAL AREAS, 3.6, 3.7, and 3.10. If the slide is caused through fault of the Contractor, the foregoing operations shall be performed at no cost to the Government. If the ~~slide~~SLIDE is due to no fault of the Contractor, the yardage ordered removed will be paid for as specified in SECTION 01 22 00.00 10, and the yardage replaced will be paid for as specified in SECTION 01 22 00.00 10, in addition to any payment due to the Contractor for materials previously placed.

3.14 DITCHES AND DEPRESSIONS

All sloughs, old pits, ditches, or depressions beyond the limits of the levee foundation within the permanent rights-of-way, when required by the Contracting Officer, shall be filled to the natural surface of the ground with approved satisfactory material. The material for the fill shall be placed in layers or lifts not to exceed 12 inches in thickness. The only compaction required will be that obtained by the necessary spreading and dumping operations, except that the equipment shall be so operated that the

tracks are distributed evenly over the surface of each lift.

3.15 EXCAVATION, EMBANKMENT, AND PREPARATION OF SUBGRADE FOR ROADWAYS

3.15.1 Subgrade Preparation

Subgrade shall be shaped to lines, grades, and cross-sections shown on the drawings; and the top 12 inches compacted to a minimum of 95 percent maximum dry density ASTM D 698. This operation shall include plowing, discing, and any moistening or aerating required to obtain specified compaction. Unsatisfactory material shall be removed and replaced with approved satisfactory material as directed by the Contracting Officer. Low areas resulting from removal of unsatisfactory material shall be brought up to required grade with approved satisfactory materials; and the entire subgrade shall be shaped to lines, grades, elevations, and cross-sections shown on the drawings, and compacted as specified. The elevation of the finished subgrade shall not vary more than 0.10 foot from the established grade and cross-section. Subgrade shall be tested according to paragraph 1.8.2.

3.15.2 Embankment

3.15.2.1 Earth Embankment

Earth embankments shall be constructed in accordance with applicable provisions in paragraphs 3.4 through 3.14 of this specification. If conditions warrant, special fill materials may be used in the embankment. However, a core of impervious levee embankment material of the same cross sectional configuration as the levee must continue through the line of protection.

3.15.2.2 Compaction

Compaction for clayey soils shall be accomplished by sheepsfoot rollers, as described in subparagraph 3.7.1.3. Compaction of any granular fill shall be accomplished by vibratory rollers, as described in paragraph 3.5, BACKFILLING, in Section 33 40 00.00 STORM-DRAINAGE SYSTEM. Measured compaction shall meet the 95 percent of maximum dry density (Standard Proctor test) as specified in subparagraph ~~1.3.5~~1.4.5 Degree of Compaction. Compaction shall be tested according to paragraph ~~1.8~~1.9 TESTING.

3.15.3 Shoulder Construction

Shoulders shall be constructed of satisfactory or borrow materials, or as otherwise shown or specified herein. Shoulders shall be constructed as soon as possible after adjacent paving is completed. Compaction shall be accomplished by sheepsfoot rollers. Shoulder construction shall be done in proper sequence in such a manner that adjacent ditches will be drained effectively; and that no damage of any kind is done to the adjacent completed pavement. The completed shoulders shall be true to alignment and grade, and shaped to drain in conformity with the cross-sections shown on the drawings.

3.15.4 Finishing

The surface of all roadway excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, cross-sections, and elevations shown on the drawings. The degree of finish for all graded areas shall be within 0.1 foot of the grades and

elevations indicated. Ditches and swales shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials.

3.15.5 Subgrade and Embankment Protection

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained in such a manner as to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operations; and shall be protected and maintained by the Contractor in a satisfactory condition until subbase, base, and pavement are placed. The storage or stockpiling of materials on finished subgrade will not be permitted. No subbase, base course ballast, and or pavement shall be laid until the subgrade has been checked and approved. In no case shall subbase, base, surfacing, or pavement be placed on a muddy, spongy, or frozen subgrade.

3.15.6 Roads

At locations where access roads to fields or buildings are destroyed because of the work required under this contract, the Contractor shall provide temporary roads, if directed by the Contracting Officer, to give access to fields and buildings during the construction period. Such facilities shall be removed after construction is complete, and replaced with permanent access roads to the extent required by the Contracting Officer.

3.15.7 Ramps

Road ramps and crossings shall be constructed at the locations shown on the drawings by placement of compacted impervious fill as specified in paragraph 3.7 EMBANKMENT CONSTRUCTION.

3.16 QUALITY CONTROL

3.16.1 Quality Control System

The Contractor shall establish and maintain quality control for work under this section to assure compliance with contract requirements; and maintain records of his quality control for all construction operations including, but not limited to the following:

- (1) Foundation materials;
- (2) Foundation preparation;
- (3) Layer thickness;
- (4) Moisture control;
- (5) Compaction;
- (6) Lines, grades, and tolerances; and
- (7) Test results.

3.16.2 Records

A copy of the records of inspections and tests, as well as the records of corrective actions taken, shall be furnished to the Government as directed by the Contracting Officer. See Section 01 45 04.00 03, CONTRACTOR QUALITY CONTROL.

3.17 Railroad Ballast and Trackwork

3.17.1 General

All ballast shall be placed in accordance to project plans, using standard railroad construction practices and equipment. Changes or substitutions must be approved in advance of installation by the Contractor. Ballast that is contaminated by foreign material during stockpiling or construction shall not be used in track construction. Contaminated material shall be removed prior to tamping. Ballast that becomes segregated by field stockpiling will be reblended to specification prior to use in track construction. Ballast section depth, width, and slope shall conform to typical section(s) shown on the plans. The Contractor will be required to add or remove ballast from the track section if deemed necessary by the Contracting Officer.

Damage to completed ballast layers/section caused by the Contractor during subsequent operations shall be repaired by the Contractor at his expense prior to acceptance of work by the Government. This shall include, but is not limited to, rutting, inter-mixing of foreign materials, or disturbance of finished shoulders.

Any Contractor furnished material which is placed and then subsequently determined through material testing to not be in compliance with the Specifications shall be removed as directed the Contracting Officer at no cost to the Government.

3.17.2 Placement of Backfill Material

In a fill section, after stripping topsoil and organic material, the entire area where the embankment is to be constructed shall be plowed and scarified for a minimum depth of 6 inches. This surface and all future fill layers shall be compacted to 95 percent of maximum density per Standard Proctor in accordance ASTM D 698 or 90 percent of maximum density per Modified Proctor in accordance with ASTM D 1557, except that a minimum of the top 2 feet of fill shall be compacted to 100 percent Standard Proctor. The top 12 inches of the subgrade in cuts shall be plowed, scarified and compacted to 100 percent Standard Proctor. The Contracting Officer shall determine the ASTM test method to be used after review of the soil analysis.

The Contractor shall notify the Contracting Officer when fill layers are ready for compaction testing. Successive layers shall not be placed prior to compaction testing. The Contractor shall not make any claims for delay to work due to compaction testing.

Field testing for density control for fill and subgrade materials shall be made in accordance with the requirements of ASTM D 1556 and ASTM D 2922 using a portable nuclear density testing device with field test locations selected by the Contracting Officer. All soil tests shall be performed at the expense of the Contractor. Testing shall not relieve the Contractor of the responsibility for ensuring that the work is done in accordance with these Specifications.

Contractor may increase the depths of successive fill layers beyond the depths specified if tests, performed at his expense, determine that the required densities can be obtained for the increased layer's depths.

Moisture content of soil shall be controlled as necessary to obtain the specified densities based upon the optimum moisture content for each

material. Water shall be added to the soil when, in the opinion of the Contracting Officer, additional moisture may be necessary to obtain the specified density. Soil that is too wet shall be allowed to dry or be worked by plowing, disking, harrowing, or other means to dry the material to a workable moisture content.

In the event a specified density is not obtained, the Contracting Officer may order additional rolling, watering, or drying of the soil as necessary to obtain the specified density. Fill layers not meeting a specified density after additional working shall be removed and new material shall be placed and compacted to the specified density at no cost to the Government.

The lower part of fills constructed across inundated areas shall be built by dumping successive loads of rock in layers no thicker than necessary to support the hauling equipment. Succeeding layers shall be constructed as specified herein.

Rutted areas shall be immediately excavated of unstable material and replaced with rock or suitable earth fill and compacted to prevent additional rutting.

3.17.3 Trackwork

The existing track and ties shall be removed to the nearest existing rail splice and reinstalled. No track shall be laid until the roadbed (subgrade and subballast) is completed and approved by the Contracting Officer. All track work shall be performed by a Contractor found acceptable and approved to work on Norfolk-Southern Railroad projects.

The Contractor shall construct, ballast, line and surface the track to the required grade and alignment. The Contractor shall be responsible for the track until the track is accepted by the Contracting Officer.

3.17.3.1 Crossties

Crosstie installation shall conform to the following:

1. Crossties shall be spaced 20 inches center to center, and laid at right angles to the track centerline with the end measuring 1 foot 10-3/4 inches from the end of the tie to the gauge line of the rail.
2. The bearing surfaces of the crossties shall be clean before tie plate and rail installation.

3.17.3.2 Tie Plate

Tie plate installation shall conform to the following:

1. All crossties shall be fully tie plated before the rail is laid.
2. The bottom of the tie plates shall be cleaned before the plate is applied.
3. Tie plates shall be applied with the 1:40 cant down towards the center of track.
4. The tie plate shall be spiked to gauge, not greater than every third crosstie, and shall be set so that the outside shoulder of the tie plate shall bear squarely against the base of the rail, having a

full bearing for the rail and, at the same time, a full bearing on the crosstie.

3.17.3.3 Continuous Welded Rail

Continuous welded rail installation shall conform to the following:

1. Installation of the continuous welded rail shall be done with off track equipment so as to not interfere with the operation of main line traffic.
2. Although the Railroad shall endeavor to unload the rail in the approximate final location, it shall be the duty of the Contractor to position the rail in its final location which may require moving the welded rail strands.
3. The following rail temperature criteria shall apply:
 - a. Prior to laying continuous welded rail, the Contractor shall determine and record the maximum and minimum rail temperatures in the area, as laying procedures are dependent on the total range of temperatures to be experienced by the rail.
 - b. Although it is a recommended practice to lay continuous welded rail when the temperature is within plus or minus 10°F. of the regional mean temperature, the Contractor shall consult with the Contracting Officer and Norfolk-Southern Railroad to establish the desired laying temperature.
 - c. When it is not possible to lay the rail at the desired laying temperature, the Contractor shall record the temperature of each rail laid and make the necessary adjustments at a later date. All adjustments shall be as instructed by the Contracting Officer.
 - d. The Contractor shall be required to keep an accurate record of rail temperatures taken three times daily (morning, noon and afternoon). Rail temperature report chart shall be furnished to the Contractor by the Railroad.
4. If relay continuous welded rail is laid, the rail shall be laid so that the least worn side of the head of the rail is on the gauge side.
5. Continuous welded rail shall be handled in such a manner as to prevent bending and damaging the rail. Any rail damaged by the Contractor, due to mishandling, shall be replaced at the Contractor's expense.
6. The bottom of the rail shall be cleaned before the rail is laid.
7. Strands of continuous welded rail shall be connected by 36 inch joint bars and bolts as directed by the Contracting Officer. In some cases only the outside holes will be drilled for later thermit welding. Continuous welded rail shall be laid without expansion gaps at the joints.
8. Joints are not allowed in continuous welded rail on or within 234 feet of open deck bridges except those associated with expansion joints.
9. The Contractor shall not be required to field weld joints.

10. Flame cutting of rails or burning of bolt holes with a torch shall be prohibited. Rails shall be cut with a rail saw only. Bolt holes shall be drilled with a rail drill only. Any Railroad or Industry owned rail which is flame cut by the Contractor shall be replaced by the Contractor at his expense.

3.17.3.4 Joint Bar

Joint bar installation shall conform to the following:

1. Joint bars shall be clean of any foreign material, except metal preservative, and properly installed with the full number of and correct size of bolts, nuts and spring washers.
2. Before placing joint bars, the bearing surfaces of the bars as well as the rail ends within the joint bar area shall be free of any foreign material except metal preservative.
3. Bolts placed with nuts alternately on inside and outside of rail shall be drawn tight before spiking.
4. Where possible, all joints shall be kept out of road crossings.
5. Before acceptance of work, all bolts shall be checked by the Contractor and, if necessary, tightened.

3.17.3.5 Final Gauging

Final gauging shall conform to the following:

1. Necessary final gauging shall be done after the rail is laid and jointed.
2. Before spikes are driven, crossties shall be evenly spaced and square to the rail. Tie plates shall be centered on the tie and provide full bearing.
3. When spiking, care shall be exercised not to spike the rail.
4. The final gauge shall be 56-1/2 inches.
5. Track shall be gauged as spikes are driven home.
6. Any crossties that do not fully bear on the subballast shall be nipped up while spiking.
7. When constructing skeleton track, final gauging and anchor spiking shall not be performed until after the track is lined to final alignment.

3.17.3.6 Anchor and Double Spiking

Anchor and double spiking shall conform to the following:

1. Track curvature shall be spiked as shown on the plans.
2. Drive screw spikes shall be used for anchor spiking of curves if specified on the plans.

3. When driving spikes in secondhand crossties, tie plugs shall be placed in all holes before driving spikes.
4. All spikes shall be started and driven perpendicular to the crosstie and square with the rail and so driven that the head of the spike shall have a full hold on the base of rail or the tie plate when anchor spiking.
5. Spikes shall not be overdriven so that the lip of the spike head bends upward.
6. No spikes shall be driven at the ends of joint bars.
7. The Contractor shall remove any overdriven spikes or spikes that are bent while driving. Tie plugs shall be placed and then spikes properly driven.
8. Relay spikes shall be used for all anchor spiking of tie plates. The Contractor shall straighten all relay spikes before use.

3.17.3.7 Rail Installation

Rail anchor installation shall conform to the following:

1. For continuous welded rail box anchor as follows:
 - a. Every other crosstie on tangent track and curves less than 3 degrees.
 - b. Every crosstie on curves 3degrees or greater.
 - c. Every crosstie 234 feet on each side of a joint.

3.17.3.8 Ballasting

Ballasting shall conform to the following:

1. The Contractor shall supply ballast. Contractor shall unload the ballast promptly upon delivery to the job site.
2. Contractor shall be responsible for unloading, hauling, transferring, spreading, tamping and dressing ballast.
3. Ballast shall be uniformly distributed as it is unloaded by the contractor after anchoring of the track has been completed.
4. The depth of preliminary ballast for surfacing shall not be more than 4 inches between the bottom of crossties and the top of subballast. Each successive raise shall not exceed 4 inches.
5. Care shall be taken to avoid disturbing or destroying any centerline or top of rail stakes.
6. The Contractor shall dress ballast to conform to typical roadbed sections as shown on the plans.

3.17.3.9 Surfacing

Surfacing shall conform to the following:

- 1. A preliminary surfacing shall follow each unloading of ballast.*
- 2. The Contractor shall thoroughly tamp (surface) track with an on-track power (mechanical) tamper.*
- 3. If jacks are used they must be placed close enough together to prevent undue bending of rails or strains at joints.*
- 4. Both rails must be raised at one time as uniformly as possible.*
- 5. The track shall not be raised more than 4 inches in one lift and ballast shall be well tamped under each crosstie before the next lift is made.*
- 6. All crossties that are pulled loose shall be restored to proper position and fully nipped and spiked before tamping.*
- 7. The Contractor shall raise the track to the final profile grades with the necessary additional ballast mechanically tamped under the crossties.*
- 8. Ballast shall be well tamped from a point 15 inches inside of each rail, on both sides and under the crosstie, to the end of the crosstie.*

3.17.3.10 Alignment

The alignment for the track shall not deviate from uniformity more than 1/8 inch at the midoffset in any 62 foot line on tangent track or more than 1/8 inch mid-offset in any 62 foot chord on curved track.

Track surface may not deviate from uniformity more than the following:

- 1. The deviation from design profile on any rail at the mid-ordinate of a 62 foot chord may not be more than 1/8 inch. Cross level must be maintained.*
- 2. Curved track shall be superelevated as shown by the plans. Deviation from superelevation on spirals may not be more than 1/8 inch.*

Upon completion of the final surfacing and lining of the track, the Contractor shall trim the ballast as shown on the plans, and dispose of any surplus ballast as directed by the Contracting Officer. The completed ballast section shall have all tie cribs filled, and crossties, tie plates and rails shall be swept clean.

-- End of Section --